APBI 402 / SOIL 502
SUSTAINABLE SOIL MANAGEMENT

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəy̓əm (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on in their culture, history, and traditions from one generation to the next on this site.

TERM 2 - 2024/25

Course Instructors*:	Maja Krzic, MCML 227	Maja.Krzic@ubc.ca
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Lectures:	Monday @ 3- 5 pm (SCRF 209) for both APBI 402 & SOIL 502 students
	Friday @ 1 – 3 pm (HEBB 116) for both APBI 402 & SOIL 502 students
Tutorial for SOIL502:	Wednesday @3-4 pm (ORCH 4072) only for SOIL 502 students, as needed.
	The 1st SOIL 502 tutorial will be on Jan 22, 2025

**Maja and Sandra are the appropriate contact persons regarding the general conduct of the course and some of the cases.*
Drs. Berch, Bomke, Grayston, Prescott, and Mr. van Ham prepared one case each and will be contributing their expertise during that specific unit of the course.

Course Description:

Application of fundamental, unifying soil science principles in sustainable management of forested, agricultural and urban or constructed ecosystems.
Prerequisite: APBI 200

Approach:

To simulate a real-life evaluation of soil properties to establish the most appropriate management practice in a particular ecosystem.

Course Learning Outcomes:

Upon completion of APBI 402 / SOIL 502 students will be able to**:**

- Utilize information available in soil survey reports or other sources of information to identify key diagnostic features of natural soils.
- Assess sustainability of land management practices utilizing physical, chemical and biological soil quality indicators
- Evaluate the soil physical environment and its manipulation and/or degradation in ecosystem management. (Specific topics may include compaction, trafficability, water management, soil erosion).
- Evaluate the soil chemical environment and its modification to enhance plant, animal and human health. (Specific topics may include: liming, fertilization, and remediation of chemical contamination).
- Evaluate soil biological processes with regard to nutrient cycling and management of organic inputs. (Specific topics may include: maintenance of soil organic matter, carbon sequestration, and recycling of various organic materials such as manures, biosolids, and green manures).
- Develop soil quality frameworks based on your assessments of soil physical, chemical, and biological processes and properties.

Course Format:

APBI 402 is run in conjunction with SOIL 502, with students enrolled in both courses participating in a modified problem-based learning (PBL) environment to meet the course learning outcomes listed above.

The course learning outcomes will be met through 3 PBL case studies, each 4 weeks in duration. Groups of 4-6 students will be assigned either a **forestry**, **urban,** or an **agricultural** land management regime in which to pursue the case study learning outcomes. Groups will be organized to facilitate interdisciplinary discussion and to provide opportunities for students from different programs to benefit from their varied experience and educational backgrounds. Each case will conclude with presentations from each group to enable a comparison of approaches within different land uses.

In addition, individual students will prepare 1,000 word reports, summarizing their own personal learning for each case.

There is no textbook for the course; background readings will be drawn from a variety of sources.

Course Marks:

APBI 402 - Sustainable Soil Management		**SOIL 502 - Advanced Sustainable Soil Management**	
Final exam	35%	Final exam	35%
Case reports prepared by individuals (3) [a]	39%	Case reports prepared by individuals (3) [a]	30%
Case seminars prepared by groups (3) [b]	21%	Case seminars prepared by groups (3) [b]	21%
		Wikipedia article (1) [c]	9%
Class participation [d]	5%	Class participation [d]	5%
Bonus points [e]	2%	Bonus points [e]	2%

[a]***Written case reports*** of 1,000 words will be prepared by individual students and will be due a week after the group presentations. Written case reports will be assessed on the basis of content and quality of writing (for more details see section on "Case Report-Writing Tips" shown at the end of this syllabus). Content of the individual case reports should demonstrate that the student has achieved the case learning outcomes and is able to discuss them in the context of the case scenario. Also, in 1-2 paragraphs each student should compare (relate) learning outcomes of their case to the cases presented by other groups. All reports should be handed in on time and **10% mark subtraction** will be made for each day being late. **Late case reports, passed day 4 will not be accepted.** IF you are ill or have extenuating circumstances which prevent you from submitting on time, please contact your instructors and a one-time extension may be granted.

[b]***Group presentations*** will be judged based on content, structure, and delivery. More detailed criteria for group presentations are given at the end of the course syllabus.

[c]***Wikipedia article for SOIL 502 students*** of approximately 1,000 words on a soil management topic to be negotiated and approved by the course instructors during SOIL502 tutorials (1st tutorial is on Jan 22, 2025).

[d]***Class participation*** will be assessed on the basis of contribution to in-class and online discussions. Group participation will be based on peer-feedback gathered after each group assignment using iPeer.

[e]***Bonus points*** of up to 2% will be awarded for attending annual workshop of the Pacific Regional Society of Soil Science (PRSSS) to be held at UBC in March. The attendance is strongly recommended. Up to 2% will be awarded for workshop attendance and ~500 word synopsis of the workshop written from the student's perspective and suitable for publication in the PRSSS Newsletter.

It is highly recommended that students attend SOIL 500 – Graduate Seminar (Friday at 3-4 pm) since most seminar topics will be complementary to what we are covering in this course.

COURSE OUTLINE

Course Introduction (Week 1) General concept of soil quality and sustainable land management

Case 1: (Weeks 1 through 5)
Case specific learning outcome: Describe soil physical environment and its manipulation and/or degradation in ecosystem management.
Case scenarios**:**
- Forestry: Impacts of mechanical disturbance on soil quality on forest landings
- Agriculture: Cattle grazing impacts on soil quality on grasslands
- Regional development: Soil erosion in the middle mountains in Nepal
- Soil water retention on volcanic ash soils in Colombia

Case 2: (Weeks 5 through 9)
Case specific learning outcome: Characterize the soil chemical environment and its modification to enhance plant, animal and human health.
Case scenarios**:**

- Forestry: Effects of site management practices on soil quality of plantation forests in the Southern Cape forest region of South Africa

•Agriculture: Soil testing as a tool for monitoring soil quality; the UBC Farm Case
•Managed landscape: Fabricated soil mixtures used as cover for Vancouver Landfill
•Forest nutrition management on a woodlot
•Community garden; the Riley Park case

Case 3: (Weeks 9 through 13)
Case specific learning outcome: Describe soil biological processes and application to nutrient cycling and management of organic inputs.
Case Scenarios**:**
•Forestry: Soil fauna on the long-term soil productivity (LTSP) sites in BC
•Forestry: Effects of variable retention harvesting on soil microbial communities in Coastal BC Forests
•Agriculture: Soil mesofauna on grazed rangelands in BC

GENERAL REFERENCES:

Brady N.C., and R.R. Weil. 2010. Elements of the nature and properties of soils (3rd ed.). Pearson Education, Upper Saddle River, NJ. 624 pp.

Craul, P.J. 1999. Urban soils: applications and practices. Wiley, New York. NY.

Doran, J.W. and A.J. Jones. 1996. Methods for Assessing Soil Quality. SSSA Special Publication Number 49. SSSA. Madison, WI. 410 pp.

Fisher, R.F. and D. Binkley. 2000. Ecology and management of forest soils. 3rd ed. John Wiley and Sons Inc., New York. 489 pp.

Krzic M., T. Naugler, S. Dyanatkar, and C. Crowley. 2010. Virtual Soil Lab Modules. The University of British Columbia, Vancouver. [http://soilweb.landfood.ubc.ca/labmodules/]

Krzic, M., K. Wiseman, L. Dampier, S. Grand, J. Wilson and D. Gaumont-Guay. 2013. SoilWeb200: An Online Educational Tool for the APBI 200 course: Introduction to Soil Science. The University of British Columbia, Vancouver [https://soilweb200.landfood.ubc.ca/]

Magdoff, F.R. and R.R. Weil. 2004. Soil organic matter in sustainable agriculture. CRC Press, Boca Raton, FL. 416 pp.

Tisdale, S.L., W.L. Nelson, J.D. Beaton and J. Havlin. 1999. Soil Fertility and Fertilizers. Collier-Macmillan.

Van Eerd, L.L., K.A. Congreves, M.M. Arcand. Y.L., and C. Halde. 2021. Soil Health and Management in Digging into Canadian Soils: An Introduction to Soil Science by Krzic M., Walley F., Diochon A., Pare, M., and Farrell, R. (Rds). Canadian Soil Science Society [https://openpress.usask.ca/soilscience/chapter/soil-health-and-management/]

UBC Policy & Academic Honesty

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website (https://senate.ubc.ca/policies-resources-support-student-success/).

Academic honesty is a core value of scholarship. Cheating and plagiarism (including both presenting the work of others as your own and self-plagiarism) are serious academic offences that are taken very seriously at UBC. By registering for courses at UBC, students have initiated a contract with the University that they will abide by the rules of the institution. It is the student's responsibility to inform themselves of the University regulations. Definitions of Academic Misconduct can be found at *https://academicintegrity.ubc.ca/regulation-process/academic-misconduct/*

The use of **generative AI tools, including ChatGPT and other similar tools,** to complete or support the completion of any form of assignment or assessment in this course is **not allowed** and would be considered academic misconduct.

APBI 402 / SOIL 502 - Schedule for tutorials and lectures

Note: SOIL 502 will also have additional tutorial on Wednesday, as needed. Dates will be posted in Canvas

Week	Date	Monday class (3-5pm)	Date	Friday class (1-3pm)
1	Monday Jan 6	***Lecture:*** Course intro & review of some relevant soil concepts	Friday Jan 10	***Lecture Maja:*** Introduction to soil quality concept **Case 1 (Soil physics):** • Impacts of mechanical soil disturbance on soil quality on forest landings in BC • Soil erosion in the middle mountains in Nepal • Cattle grazing and its impacts on soil quality • Soil water retention on volcanic ash soils in Colombia
2	Monday Jan 13	**Case 1 (Soil physics)** 3-4pm: ***Lecture Maja*** Physical attributes of soil quality 4-5pm: Group work	Friday Jan 17	**Case 1 (Soil physics)** Group work to assist groups and individual students to prepare for oral presentations and written reports
3	Monday Jan 20	**Case 1 (Soil physics)** 3-4pm: ***Lecture Sandra*** Soil Erosion 4-5pm: Group work	Friday Jan 24	**Case 1 (Soil physics)** Group work
4	Monday Jan 27	**Case 1 (Soil physics)** Group work	Friday Jan 31	**Case 1 (Soil physics)** Group work
5	Monday Feb 3	**Case 1 (Soil physics)** Group presentations	Friday Feb 7	***Lecture Sandra:*** Chemical soil quality indicators: productivity or sustainability? **Case 2 (Soil Chemistry)**: • Effects of site management practices on soil quality of plantation forests in the Southern Cape forest region of South Africa • Soil fertility assessment of the UBC Farm • Soil chemical assessment of fabricated mixes as the Vancouver Landfill • Forest nutrition management • Soil fertility assessment of the Riley Park community garden

6	Monday Feb 10	**Case 2 (Soil chemistry)** Group work	Friday Feb 14	**Case 2 (Soil chemistry)** Group work ***Cindy Prescott*** visits with her case group
	Monday Feb 17	***Feb 17-Family Day, UBC closed*** ***Reading break – UBC closed***	Friday Feb 21	***Reading break - UBC closed***
7	Monday Feb 24	**Case 2 (Soil chemistry)** Group work	Friday Feb 28	**Case 2 (Soil chemistry)** Group work, and Lecture by ***Mike van Ham*** Use of biosolids to create constructed soils
8	Monday Mar 3	**Case 2 (Soil chemistry)** Group work	Friday Mar 7	***In-class activity Sandra:*** The role of soil organisms in soil quality **Case 3 (Soil biology):** • Soil fauna at a LTSP site • Effects of long-term grazing on abundance and diversity of soil mesofauna • Effects of variable retention harvesting on soil microbial communities in coastal BC forests
9	Monday Mar 10	**Case 2 (Soil chemistry)** Group presentations	Friday Mar 14	**Case 3 (Soil biology)** Group work
10	Monday Mar 17	**Case 3 (Soil biology)** Group work and ***Shannon Berch*** visits with her case group	Friday Mar 21	**Case 3 (Soil biology)** Group work
11	Monday Mar 24	**Case 3 (Soil biology)** Group work	Friday Mar 28	**Case 3 (Soil biology)** Group work
12	Monday Mar 31	**Case 3 (Soil biology)** Group work	Friday Apr 4	Course summary - Maja & Sandra
13	Monday Apr 7	**Case 3 (Soil biology)** Group presentations		

Group Presentations: Components & Judging Criteria

Group presentations will be judged based on content (60%), structure (30%), and delivery (10%). Presentations should be a maximum of 15 minutes, followed by up to 5 minutes of questions. Teams will be penalized for presentations that are overly long (or short).

Content (60%)

1. Content was presented in a clear and concise manner.
    a. Explains theory and potentially complex material clearly (e.g., no jargon or jargon is explained).
    b. There was sufficient detail for an out-of-field observer to follow the presentation.
2. Objective for your case study was clearly articulated, and the role of soil type relative to management discussed.
3. Provide explanation on how were data collected (e.g., study sites and management treatments are described, differences among soil types are explained).
3. Include your framework and discuss key indicators and processes specific to your function.
4. Explain the key findings of your study case (e.g., summary of main points, suggestions for future research/directions, thought-provoking comments on where do we go from here).

Structure (30%)

1. The presentation started in a manner that captured the audience's interest and was relevant to the body of the presentation.
2. The points were presented in a logical manner, including a clear study design / explanation of management treatments.
3. The presentation is closed in a manner that links key findings to the study case's objective.
4. Length (kept to allotted time).

Delivery (10%)

1. The students' presentation kept the audience's interest and engaged the interest and participation of the other groups.
2. Audio-visual aides were used in a manner that supported the presentation. Slides should not include unnecessary acronyms or symbols. Tables and graphs should include only key information needed to make your point.
3. Speech: projected well (everyone could hear), presenters did not speak too quickly.
4. Handled questions well (if did not understand question paraphrased back to the questioner, demonstrated critical thinking if answer is not immediately obvious, makes an educated guess, if does not know the answer says so, shows confidence in ability to answer questions).

Sample presentation outline:

- Title page
- Objective
- Study site
- Soils
- Treatments / study design
- Framework (multiple slides)
- Data and interpretation (multiple slides)
- Implications / recommendations

Case Report: Writing Tips & Grading Criteria

Word limit of 1,000 words does **not** include tables, figures, list of references, cover page, and appendix (assuming that you decide to include an appendix in your paper).
Reports must be written in your own words.

- Tips on how to approach preparing the case report:
  - Before you start writing the report, make an outline and identify the key sub-sections.
  - During the writing process, refer frequently to the learning outcomes to keep yourself on track.
  - Before you submit the paper, make sure that it is **correct, clear, concise, consistent,** and **complete** (so-called 5 Cs of communication).

CONTENT (60%)

- Provide background information on the study site(s) and management practices (or treatments if your case is done on an experimental field) as well as soil type, climate, topography, parent material, and type of vegetation on the study site(s). Soil type should be discussed regarding its natural advantages and disadvantages for a specific management practice.
- Outline study objective(s).
- Develop a soil quality framework [**Function → Process → Attribute (Property) → Indicator**] and justify selection of indicators focusing on the management practice of your case study.
- Discuss key data of your case study, ensuring that you address both data trends and connections among different groups of data.
- Briefly summarize the body of your report and restate your argument. Always remember to check do your conclusions match the study objective(s).

ORGANIZATION, GRAMMAR, AND WRITING STYLE (10%)

- Use logical structure appropriate to report's topic.
- Provide background information on case setup (e.g., study treatments, soil, climate) and integrate it with data discussion.
- Ensure that your report is free of spelling, punctuation, and grammatical errors.
- Keep your sentences simple. That does not necessarily mean that your thoughts are simple. Complex and adjective-laden sentences just make your great ideas hard to follow.
- Each paragraph should contain one main idea. Paragraphs should be logically organized. For example, you should discuss ideas in the order in which they appear in your introduction.
- We strongly encourage you to refer to "***Professional Communications Handbook***" by Garland and Shackleton (http://lfs-lc-collabtm.sites.olt.ubc.ca/files/2013/11/professional.communication.handbook.pdf).

COMPARISON TO OTHER CASES (30%)

- In 1-2 paragraphs, compare and/or relate key findings of your case to the cases presented by other groups.
- Focus on the soil function, processes and properties (indicators), avoiding any elaboration of different management practices used in different case studies.
- Consider developing a table highlighting similarities and differences between cases.

Sample report outline:

- Background (includes problem statement)
    - Objective
    - Study site
    - Soils (& their relevance)
    - Treatments / study design
- Framework
    - Justification for indicators
- Data & interpretation
- Summary, implications and recommendations (short)
- Case comparison
- References

Use of subheadings is strongly recommended